

## WINTER ROOST SITES OF NORTHERN HARRIERS AND SHORT-EARED OWLS ON ILLINOIS GRASSLANDS

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**ABSTRACT.**—Characteristics of the diets and roosting habitats used by Northern Harriers (*Circus cyaneus*) and Short-eared Owls (*Asio flammeus*) on grassland sanctuaries in Jasper and Marion counties, southeastern Illinois, were described for December 1993 and January 1994. Northern Harrier communal roosts contained from 21–43 individuals and were only observed in undisturbed cool-season grasses. Short-eared Owls also roosted communally (3–17 individuals) but the two species were not observed to roost within the same fields. Short-eared Owls roosted in shorter cover than Northern Harriers, but there was no evidence of selection for any grass or management type by Short-eared Owls. Both species frequently fed on southern bog lemmings (*Synaptomys cooperi*) and avian remains were found in less than 5% of all pellets.

**KEY WORDS:** *Northern Harrier, Circus cyaneus; Short-eared Owl, Asio flammeus; communal roosts; roost habitat; diet.*

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Perchas de invierno de *Circus cyaneus* y *Asio flammeus* en las praderas de Illinois

**RESUMEN.**—Las características de las dietas y de las perchas utilizadas por *Circus cyaneus* y *Asio flammeus* en los santuarios de praderas de los condados de Jasper y Marion en el sur de Illinois fueron descritas en Diciembre de 1993 y Enero de 1994. Las perchas comunales de *Circus cyaneus* estaban compuestas por 21–43 individuos y fueron detectadas en pastizales estacionales no perturbados. *Asio flammeus* utilizó perchas comunales (3–17 individuos), las dos especies no utilizaron perchas en el mismo campo. *Asio flammeus* utilizó perchas en sitios de cobertura menos altos que los utilizados por *Circus cyaneus*. No hubo evidencia que *Asio flammeus* tuviera alguna preferencia por algún tipo de pastizal o área de manejo. Las dos especies se alimentaron frecuentemente de *Synaptomys cooperi*. Restos de aves fueron encontrados en menos del 5% del total de egagrópilas.

[Traducción de César Márquez]

Both the Northern Harrier (*Circus cyaneus*) and Short-eared Owl (*Asio flammeus*) are noted for their communal winter roosts in the Midwest (e.g., Weller et al. 1955, Mumford and Danner 1974). Little has been reported, however, on the characteristics of habitats that are selected for roosting. Because both species are listed as Endangered in Illinois (Herkert 1992), information regarding the specific habitats these species use would help in their conservation.

Most studies of these two raptor species have reported that they capture similar prey, particularly small rodents (Colvin and Spaulding 1983, Clark and Ward 1974, Craighead and Craighead 1956). Therefore, they may overlap in diet and, as a result,

competition for food may influence their habitat use. The purpose of this study was to document roost site characteristics of Northern Harriers and Short-eared Owls on a 800-ha grassland sanctuary system in southeastern Illinois. I also collected pellets to examine the diets and possible competition between these two species.

### METHODS

The study was conducted at the Prairie Ridge State Natural Area in Jasper and Marion counties, approximately 800 ha of restored grassland tracts managed particularly for Threatened and Endangered wildlife. The Jasper and Marion county units are approximately 60 km apart. A total of 13 tracts (seven in Jasper county and six in Marion county), ranging in size from 7–120 ha, were examined. Within each county, tracts averaged 0.8 km from their nearest-neighbor tract. The maximum distance between any two tracts was about 7 km. Tracts were further subdivided into management units averaging about 3 ha (range 0.5–15 ha). The areas studied were about 75% introduced cool-season grasses such as redtop

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bentgrass (*Agrostis alba*), timothy (*Phleum pratense*), smooth brome (*Bromus inermis*), and bluegrass (*Poa* spp.), and 25% native warm-season grasses such as switchgrass (*Panicum virgatum*), big bluestem (*Andropogon gerardii*), indiagrass (*Sorghastrum nutans*), and little bluestem (*Schizachyrium scoparium*). Management measures include mowing, haying, limited grazing, and undisturbed fields (Simpson and Esker 1997).

Northern Harriers and Short-eared Owls were observed from 26 December 1993–12 January 1994 to determine habitats used for roosting. Observations were made from a stationary vehicle and were continuous from 1.5 hr before sunset until dark. Each tract was surveyed for one evening. Two small (<20 ha), adjacent tracts were surveyed simultaneously once and three large tracts were divided and observed from two locations when topography and size prevented a complete survey from a single location. A total of 13 tracts were surveyed from 15 points, each with an observation radius of  $\leq 500$  m. Every available tract was observed for the same amount of time regardless of the level of raptor activity in that tract. The locations of Northern Harriers landing in communal roosts and of Short-eared Owls coming off of communal roosts were recorded on detailed site maps. Population estimates of Short-eared Owls were obtained by flushing birds off of all known communal roost sites on 30 December (Jasper county) and 6 January (Marion county) at midday (1000–1400 H). The population of Northern Harriers was estimated by summing the number of birds observed roosting on each tract. Visual obstruction measurements (Robel et al. 1970) were made to characterize vegetation height and density at 10 Northern Harrier and six Short-eared Owl communal roost sites during the day in January 1994. Vegetation type and management history were provided for each management unit within grassland tracts by the grassland managers, confirmed in the field, and recorded for the roosting site of every individual observed of both species.

Pellets were collected from the roost sites of each species. Pellet identification was further confirmed based on characters described by Holt et al. (1987). Pellets were carefully separated, teeth and/or skulls were identified when possible according to Hoffmeister (1989), and non-mammalian remains were noted.

## RESULTS

The wintering population of Northern Harriers was estimated to be at least 102 birds, or 12.3 harriers/100 ha. The Short-eared Owl population was estimated to be at least 34 birds, or 4.1 owls/100 ha.

Three Northern Harrier and five Short-eared Owl communal roosts were documented. The number of harriers at each communal roost ranged from 21–43 birds ( $\bar{x} = 34$  harriers). Individually roosting Northern Harriers were recorded five times. Only a single roost site occurred in Marion county. Double-counting of Northern Harriers between days on the two Jasper county communal roost sites was possible, but did not alter popula-

tion estimates by more than about 5%. A site manager observed one roost site (which I had previously surveyed) on the same evening I surveyed the second Jasper county roost. Only 2 more harriers were counted than I had previously counted at the roost. Short-eared Owl communal roosts contained from 3–17 individuals ( $\bar{x} = 6.8$  owls). One Short-eared Owl was observed roosting individually. Flush counts of Short-eared Owl communal roosts were the same (four of five roosts) or larger (observation estimate = 15 owls and flush count = 17 owls) than counts derived from observing owls leaving the roosts in the evenings.

Northern Harrier communal roosts were only observed in undisturbed areas of cool-season grasses. Due to the small samples of these roosts, the results were not significant (Table 1). Short-eared Owls were not found to select a particular cover type (Table 1). However, 32 of 34 total roost observations were in shorter vegetation of mowed grasses (15 observations) and new grass seedings (17 observations). Average visual obstruction height (Robel et al. 1970) at harrier roosts ( $\bar{x} = 25$  cm) was significantly higher than at owl roosts ( $\bar{x} = 12$  cm;  $t = 2.64$ ,  $df = 5$ ,  $P < 0.025$ , separate variance  $t$ -test). Short-eared Owls tended to roost at the base of a dense clump of grass within a field of much thinner cover, while Northern Harriers roosted in relatively even stands of grass.

Rodents accounted for 100% of the mammalian remains found in 65 Northern Harrier and 52 Short-eared Owl pellets. The only rodent species identified was the southern bog lemming (*Synaptomys cooperi*). Every pellet analyzed contained rodent remains. A few also contained unidentified passerine bird remains (4.6% of the harrier pellets and 3.8% of the owl pellets).

## DISCUSSION

Northern Harriers and Short-eared Owls have used the Prairie Ridge State Natural Area for at least 25 years as a wintering ground (R. Westmeier, pers. comm.). Since 1990, winter raptor censuses have reported 100–150 harriers and 25–50 owls annually (S. Simpson pers. comm.). This consistent level of winter activity seems unique to the region, as Bildstein (1979) shows high variation in harrier activity in Ohio and Weller et al. (1955) remarked on the ephemeral occurrence of both species in Missouri.

Habitat of harrier communal roosts has been described as often-damp wheat stubble fields over-

Table 1. Relative availability of cover types and numbers of Northern Harrier and Short-eared Owl winter communal roosts located within each cover type in Illinois.

COVER TYPE <sup>a</sup>	% OF AVAILABLE GRASSLAND	# OF NORTHERN HARRIER COMMUNAL ROOST SITES		# OF SHORT-EARED OWL COMMUNAL ROOST SITES	
		OBSERVED	EXPECTED <sup>a</sup>	OBSERVED	EXPECTED
Undisturbed cool-season grass	42.5	3 roosts (99 harriers)	1.3 roosts	2 roosts (19 owls <sup>b</sup> )	2.1 roosts
Mowed cool-season grass	33.7	0 (1 harrier)	1.0 roost	2 roosts (10 owls)	1.7 roosts
Undisturbed warm-season grass	15.4	0	0.5 roost	0	0.8 roost
Mowed warm-season grass	8.4	0 (2 harriers)	0.3 roost	1 roost (5 owls)	0.4 roost
			$\chi^2 = 4.19$ $P = 0.24$		$\chi^2 = 4.28$ $P = 0.23$

<sup>a</sup> Expected values for number of roost sites per cover type were calculated as the total number of observed communal roost sites for a species multiplied by the proportion of each available cover type.

<sup>b</sup> 17 of 19 of these observations were from one young (<1.5 yr) *Bromus inermis* seeding. This field was atypical of undisturbed cool-season grasses, being shorter with grass in scattered clumps.

grown with ragweed (*Ambrosia artemisaefolia*) to a height of 60–90 cm (Weller et al. 1955), stubble fields, prairie grasses, and fescue 60–110 cm tall with up to “several inches” of water (Mumford and Danner 1974), and weedy old fields (Colvin and Spaulding 1983). In this study, harriers roosted in fields with dense cover up to a height of about 45 cm and thinner screening cover to a height of 1.0–1.2 m. Fields of undisturbed redtop bentgrass and timothy and undisturbed smooth brome fit these characteristics. One communal roost was situated in a wet field, with the others in well-drained areas.

Short-eared Owl communal roosts have been even less frequently described, but Weller et al. (1955) found the roosts in dense grass less than 30 cm high, frequently in a tuft of grass. My observations closely agree, with communal roost sites often found in fields mowed to 30–40 cm. Seventeen of the 19 observations of Short-eared Owls roosting in undisturbed cool-season grasses came from a single field which had been sowed to smooth brome 15–16 mo previous to this study. That field was atypical of undisturbed cool-season grass fields, being quite short (under 50 cm versus the typical 100–120 cm) and the grass in isolated clumps as opposed to an even stand. This type of structure was more typical of mowed areas. Available fields of undisturbed warm-season grass may have been too tall or too dense to be suitable for roosting for either species.

Bildstein (1979) showed that Northern Harrier communal roost sites were centrally located within

a foraging area. I likewise observed birds leave and arrive at roost sites from all directions. Individual harriers were followed for over 7 km from foraging areas in the surrounding agriculture landscape to the roosting area, and birds were frequently seen foraging up to 16 km from the roost site. No other roosts were found or reported locally. Short-eared Owls were observed foraging on grasslands and adjacent agricultural lands, but the distance they traveled to foraging areas was not known.

Other studies of the winter dietary habits of Northern Harriers and Short-eared Owls have shown that they have similar diets and utilize any abundant mid-sized prey available. Rodents are normally the primary prey (e.g., Weller et al. 1955, Craighead and Craighead 1956, and Colvin and Spaulding 1983, Holt and Leasure 1993). Only occasionally are birds taken in large numbers (e.g., Collopy and Bildstein 1987, Holt and Leasure 1993). My results were similar to these studies, with rodents being the primary winter food used by both Northern Harriers and Short-eared Owls. Long-term small mammal data are unavailable for this site, but current research indicates rodent populations are relatively high (E. Heske pers. comm.).

This site is the last in Illinois to host the Endangered Greater Prairie-Chicken (*Tympanuchus cupido*). No evidence was found indicating that these raptors kill prairie-chickens despite the high raptor density. Northern Harriers do, however, harass prairie-chickens displaying on leks in both the

spring and autumn (S. Simpson and R. Westemeier pers. comm.; J. Walk pers. obs.), although the largely-migrant harrier population is much reduced by the time prairie-chicken breeding begins. Therefore, it appears that maintaining prairie-chickens and grassland raptors are compatible management objectives.

These two open country raptors exhibit a great deal of sympatry and habitat and dietary overlap (Clark and Ward 1974), potentially contributing to interspecific competition. Schoener (1983) demonstrated that overlap of macrohabitat usually does not lead to competition, whereas overlap of microhabitat and food usually does. This study suggests that Northern Harriers and Short-eared Owls utilize separate roosting habitat. The diets of these species were essentially identical. However, niche overlap does not necessarily translate into competition (Holt 1987). Rodents may have provided a superabundant food source, foraging habitat may have differed, or foraging densities may have been so low as to make exploitation competition levels insignificant. Further isolating the species with respect to foraging behavior is timing. Harriers are apparently restricted to hunting during daylight hours. Short-eared Owls are not limited in this sense, but are primarily crepuscular (Clark and Ward 1974, Holt and Leasure 1993). Some level of interference competition exists between the species, which manifested itself during this study in the form of aerial sparring in the mornings and evenings as one species became active and the other returned to communal roost sites. In part due to occasional kleptoparasitism by Northern Harriers, Clark (1975) concluded that the Short-eared Owl is a fugitive species, which accounts for occasional, temporary food and habitat overlap.

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